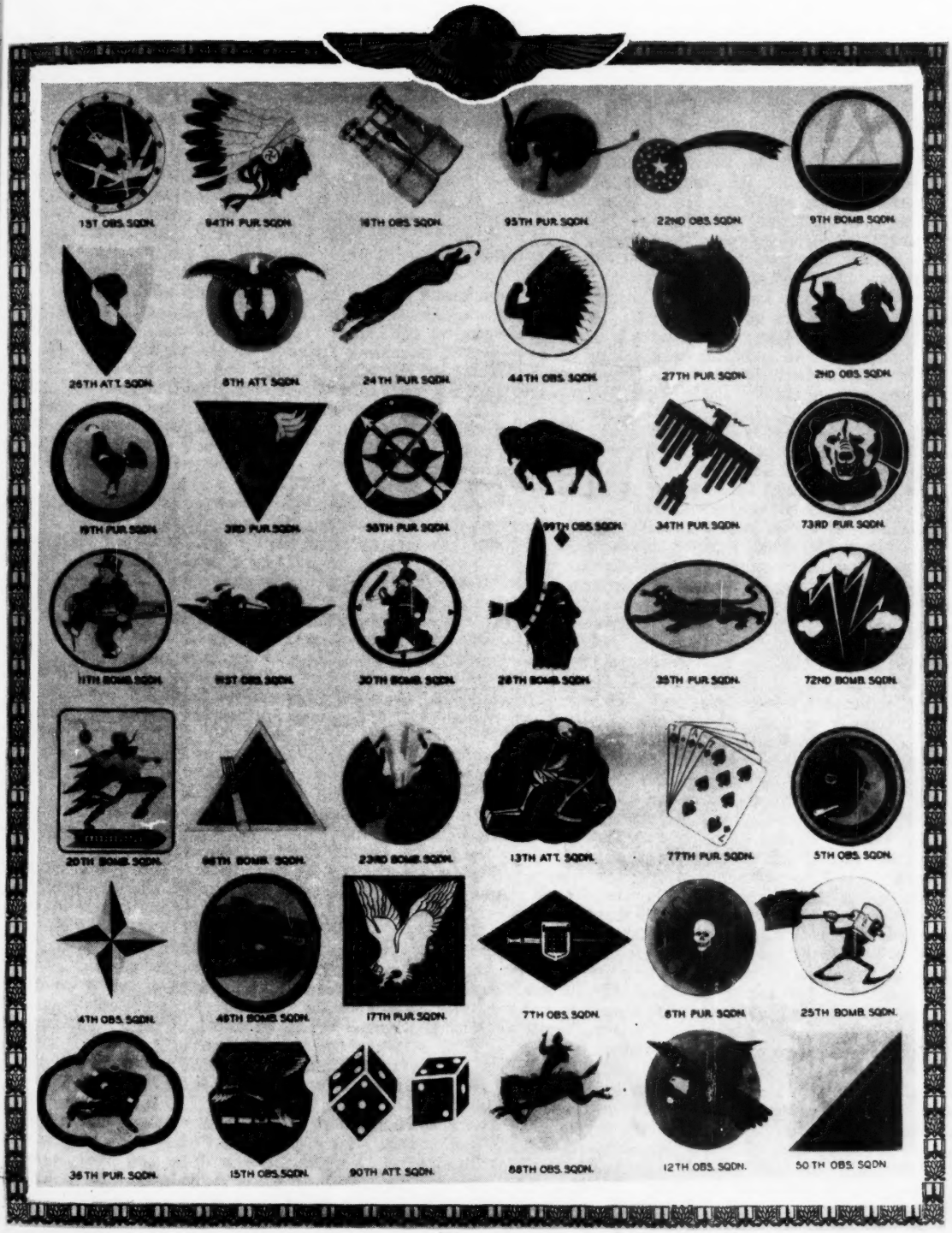
ASTOR, LENOX AND TILDEN FOUNDATIONS

AIR CORPS NEWS LETTER

ISSUED BY THE
OFFICE OF THE CHIEF OF THE AIR CORPS
WAR DEPARTMENT
WASHINGTON D.C.



Vol. XVII April 28, 1933 No. 4

THE NEW YORK
PUBLIC LIBRARY
ASTOR LENOX AND
TILDEN FOUNDATIONS

VOL, XVII AIR CORPS NEWS No. 4

Information Division, Air Corps — April 28, 1933 — Munitions Building, Washington, D.C.

The chief purpose of this publication is to distribute information on aeronautics to the flying personnel in the Regular Army, Reserve Corps, National Guard, and others connected with aviation. Publishers are authorized to reprint material appearing herein, except that portion of the News Letter beginning with Notes from Air Corps Fields.

---oOo---

THE NEW ARMY TC-13 AIRSHIP

The Army Air Corps is conducting preliminary tests on the largest non-rigid type airship thus far constructed in this country. The tests which are under way at Akron, Ohio, where the airship was also constructed, are for the purpose of determining the performance of the airship prior to its delivery to Langley Field, Va. which will be the operating base while extensive tests are conducted to determine its suitability for coast patrol operations. While the ship might be considered small when compared with the large rigid type airships, nevertheless this particular airship, known as the TC-13, is over 200 feet long and has a displacement of approximately 11 tons, of which 4½ tons are available for the useful load in the form of crew, equipment, fuel and armament.

Although this airship is a non-rigid type, which means that no internal structure contributes to the maintenance of its form, which in a non-rigid is obtained purely by the pressure of the helium gas contained in the envelope; it is of such size that it was possible to provide a large number of special features and accommodations that are usually only to be found in the larger rigid types. Facilities for the preparation of meals in flight have been made, along with sleeping quarters and all necessary accommodations for the crew of six men during extended flights of four or five days.

The car, which is over 40 feet long, is suspended directly beneath the envelope and all the wires which support the car are contained within the envelope. This arrangement differs from the usual Army practice of suspending the car several feet below the envelope and supporting it by a large number of external wires. The bottom of the car is constructed in the form of a boat to permit landing on water, and for this purpose a sea anchor, which in reality is a large inverted canvas umbrella, is being developed and will eventually be included as part of the airship's equipment for flights over water.

Perhaps the most interesting item of equipment on this airship is the small sub-cloud observation car, which may be lowered from the airship by a flexible cable that contains a telephone line which makes it possible for the observer in the sub-cloud car to communicate with the crew in the airship and even direct its maneuvers during certain weather conditions when this procedure is advisable. This car will also lend itself to a number of special forms of observation and photographic work and will be the object of experiments to be conducted at a later date. This small sub-cloud car is of wooden construction, streamlined, and painted in such a manner as to harmonize with the color condition to be expected in a dark cloudysky, the intention being to render it practically invisible under these conditions. For raising and lowering the sub-cloud car, a small power-driven windlass is installed in the airship car, which is capable of raising the sub-cloud car with the observer at a rate of 200 feet per minute. The lowering of the car, of course, can be accomplished without the use of the engine; nevertheless, special automatic brakes have been installed to limit the rate of descent. It is also possible to raise the car by hand operation of the windlass in case of engine trouble or failure.

The airship is powered by two 375 h.p. geared air-cooled engines, mounted on outriggers extending out from the sides of the car. Walkways are provided on these outriggers to permit access to the engines for inspection or minor adjustments during flight. This particular feature is noteworthy because of the fact that an airship remains in the air due to the buoyancy of the helium gas rather than due to lift obtained by forward speed and it is, therefore, possible to actually stop the engines in order to conduct inspection or repair, as the engines are primarily used for propelling the airship forward instead of to obtain lift. The stopping of the engine in flight affects only the forward speed and does not necessarily mean that the airship has lost any of its lifting characteristics. Twelve-foot diameter propellers are installed on the engines, which are geared in such a manner that the propellers will turn at a comparatively slow speed; which feature, in combination with the special mufflers on the engines, results in a very quiet power plant installation and for tactical reasons was given special attention during the design of this ship. Besides the two engines used for propelling the airship, three small marine type outboard engines are utilized for driving various items of special equipment installed in the car. One of these small engines is used for driving an air blower to supply air to the ballonets in the envelope, by means of which the pressure and shape of the envelope is maintained. Under ordinary operations the air for maintaining pressure in the envelope is obtained from air scoops installed in the slipstream of the propellers, so that this small power-driven blower is only an auxiliary provision for supplying the air which is necessary to maintain the rigidity of non-rigid envelopes. Another small engine is used for driving an auxiliary radio generator installed in the car and can be used as a source of energy for radio communication when the airship is on the ground or water and the regular radio generator is inoperative. The third small engine is the one used on the windlass for raising and lowering the sub-cloud observation car.

The latest type long range two-way radio communication equipment is installed, as well as special direction finding equipment and all other navigational instruments required for operations over water. Provision has also been made for armament; both bomb racks and machine gun mounts having been built into the car.

Another feature which is of special interest is the fuel and water ballast tank installation, which in reality is only one installation, as the fuel tanks when empty may be filled with water ballast to maintain the ship in equilibrium at all times. This is usually accomplished on the larger rigid type airships by condensation of the engine exhaust, which condenses in the form of water that may be stored on board the ship and compensate for the fuel consumed. In the case of the Army's TC-13 airship, water is obtained by an apparatus that is dropped into the ocean while the airship is flying at a reduced speed and is then raised up into the car and pumped into the empty fuel tanks. The water is raised by the same windlass equipment used for the sub-cloud observation car. To insure that no water en-

ters the fuel system, special fuel and water segregators are used.

This airship was designed by the Air Corps Materiel Division at Dayton, Ohio, during the past year and represents the latest development and improvements in the materials of construction entering into the make-up of a non-rigid airship and has made it possible to include a number of features that heretofore have only been considered possible in the larger semi-rigid types.

A special portable type mooring mast, set on wheels and drawn by a tractor, similar in design to those employed for handling the large rigid type airships is also under development and will be used for maneuvering the TC-13 airship in and out of the hangar. Ordinarily, airships are moored at the extreme nose but in this case the mooring mast is attached to the bottom side of the envelope mid-way between the nose and the car.

The ship was constructed by the Goodyear-Zeppelin Co. of Akron, under the supervision of Capt. Clarence B. Lober, Army Air Corps Inspector, stationed at that plant. The maiden flight will probably be made with him and Major Wm. E. Kepner, the lighter-than-air expert at Wright Field, as two members of the crew of six.

---oOo---

MITCHEL FIELD GUNNERS TALLY HIGH SCORES

Mitchel Field has just wound up her first gunnery season in the deep south with surprisingly good results, considering the handicap which work in the field usually imposes on the gunners. Once the camp was set up and functioning, the First Squadron went to work with a vengeance and rang up some scores which they considered good enough to keep their successors, the 99th, worried for a while. The 99th went them one better and boosted the high score for the field several dozen rungs up the ladder.

At this point the 5th Squadron took over Chapman Field to wind up the season. The 5th usually does come to bat in the clean up position and proceeded to do a very good job of it. Out on the range at sumup, they blasted away at every kind of a target we have and succeeded in ripping some man sized holes in most of them. Lieut. Cork was high man for the field on ground target with a score of 745, exclusive of tow target and bombing, and Lieuts. Gerhart and Merewether were second and third with 736 and 735, also exclusive of the above. Lt. Philip was high on the flexible sleeve with 890 out of a possible thousand. An extra curricular activity, consisting of ferretting out sharks with machine gun bullets was indulged in by many an enthusiastic gunner. An award of "Sharkshooter" was given to Lieut. A.F. Merewether for his endeavors in this field.

---oOo---

IN MEMORY OF THE MEN LOST ON THE "AKRON"

At the noon meal, on April 5th, of the Air Corps Technical School Detachment, which mess is attended by practically all enlisted men of Chanute Field, a service of brotherly sympathy was held for those comrades of the air, the Naval officers and sailors lost in the crash of the U.S.S. AKRON on April 4th. The service, entirely spontaneous on the part of those participating, was held on the suggestion of Captain Edwin F. Carey, and was conducted by Major Milton O. Beebe, Post Chaplain. Each of the several hundred men present stood and faced the New Jersey coast, in silence for one minute, followed by Taps, after which they joined in the Lord's prayer, led by Major Beebe. Chanute Field and the Air Corps Technical School expressed by this noon hour gesture their deep respect for the airmen who lost their lives in the proud manner of Naval tradition, and in the service of memory, extended their sincerest sympathy to the families of the lost Naval fliers.

---oOo---

S. A. E. DAY AT SELFRIDGE FIELD

April 11th was Engineers' Day at Selfridge Field, during which a large group of engineering students from Michigan engineering schools made an inspection of the equipment and facilities of this field. The tour was arranged and sponsored by the Detroit Section of the Society of Automotive Engineers, arrangements having been made with Major George H. Brett, Commanding the post, to receive the students and show them how a military aviation field is operated.

About a thousand students from six different colleges enjoyed and benefitted from the inspection tour. The schools represented included the University of Detroit, Detroit Tech., Michigan State, Cass Tech., Lawrence Tech., and the University of Michigan. They were divided into groups on their arrival at the field, and junior officers detailed to take the groups through the hangars, operations offices, meteorological offices and the utilities buildings. A demonstration formation flight was planned, but it was cancelled because of rain and fog. After the tour of the buildings, the students were conducted to the Post Theatre, where they witnessed films of flying activities.

---oOo---

ASSIGNMENT OF GRADUATES OF A.C.TACTICAL SCHOOL

Special Orders of the War Department were recently issued, assigning to duty at various stations, upon their graduation, Air Corps officers now attending as students the Air Corps Tactical School at Maxwell Field, Montgomery, Alabama. Seven of these officers are due to serve as Instructors, Air Corps, National Guard organizations, Captain Wendell B. McCoy goes to Murfreesboro, Tenn.; Capt. Myron R. Wood to Denver, Colo., with the 45th Division; 1st Lieuts. Louis M. Merrick to Hartford, Conn. with the 43rd Division; Edwin B. Bobzien to Logan Field, Baltimore, Md., with the 29th Division; Julian B. Haddon to Birmingham, Ala. and John A. Kase to St. Paul, Minnesota; and George H. Beverley to Boston, Mass.

Captains Walcott P. Hayes and Samuel G. Frierson go to the Hawaiian Department; Charles W. Sullivan to Rockwell Field, Calif.; Younger A. Pitts to Air Corps Detachment, Ft. Leavenworth, Kans.; Floyd E. Galloway to Crissy Field, Calif.; 1st Lieuts. John D. Corkille to Fort Crockett, Texas; Frederick I. Patrick to Barksdale Field, La., and Samuel P. Mills to Office of the Chief of the Air Corps, Washington.

---oOo---

ASSIGNMENT OF GRADUATES OF ENGINEERING SCHOOL

Of the Air Corps officers now on duty as students at the Engineering School, Air Corps, Wright Field, Dayton, Ohio, six are slated for duty at the Materiel Division following their graduation, viz: 1st Lieuts. James F.J. Early, James M. Gillespie, Mervin E. Gross, Clarence S. Irvine, Paul W. Wolf and 2nd Lieut. Robert F. Travis. Other prospective graduates are assigned to duty as follows: 1st Lieut. James E. Parker to the Office of the Chief of the Air Corps, Washington; 1st Lieut. Adolphus R. McConnell to Kelly Field, Texas.

---oOo---

Two field officers of the Air Corps, on duty as Instructors, are slated for other duties in the near future. Lieut.-Col. Wm. C. McChord who served at the Command and General Staff School, Ft. Leavenworth, goes to Panama, and Major Earl Naiden from Army War College to Fort Crockett, Texas.

FIELD ARTILLERY AND THE LOW-FLYING ATTACK

By Major Louis E. Hibbs, Field Artillery

- Concluded -

What are the means which we are going to employ to make it so dangerous to the enemy that he will accept the disadvantages of higher altitude rather than risk the casualties which will result from his low flying attack?

We know that danger of collision with obstacles is one of the things which would force him to abandon low altitude flight and if we could devise some means of presenting him with this possibility, such as towing small balloons over a column by means of steel wires, it would certainly be a deterrent to him. However, such a procedure might require very expensive equipment of a sort not now used, it would be very complicated in operation, and would be most troublesome during movement because of overhead obstacles such as trees and wires. This idea is mentioned here as a possibility - not a probability; while it might find a use in a war of stabilization for protection of fixed installations, in the same manner as it was used in the protection of areas during the World War, it, and other similar devices, do not seem to warrant serious consideration until we have exhausted the possibilities of attack of the plane by fire from the ground. It will be noted that this latter form of protection extends its danger space to an altitude only limited by the effective range of the ground weapons, while an obstacle form of protection, at best, is of limited range both in direction and altitude, and is dependent upon accidents of fortune for definite material results.

There are two methods of attacking a plane by fire: first, by continuously firing at it during the time it remains within view; second, by putting up a barrage of fire through which the plane must pass. The latter of these two methods, while it offers possibilities of course, has so many apparent disadvantages that it appears not worthy of development unless, after thorough investigation and trial, the former method proves itself of little value.

Before entering upon the discussion of the characteristics of the weapon which we need, let us develop the time and space factors of the situation under which it will be employed.

The attack plane will come into view of our guns at ranges between 100 and 500 yards. It will attack and immediately seek the nearest cover, which, we may say, will lie not over 500 yards away. If it is attacking a concentrated target, these assumptions give 1000 yards as the maximum length of travel of the plane while it is susceptible of being fired upon by our guns. This distance, in the case of a target having length and being enfiladed, will be increased by the length so attacked, about 400 yards as a maximum. A plane flying at 200 miles per hour moves at a rate very close to 100 yards every second, so that the maximum time (under our assumptions) that the attack plane may be taken under fire by our ground weapons will vary from ten to fourteen seconds. This time estimate is given as the maximum; in the average case, where cover close to the target exists, the time will be cut materially and will probably average from six to ten seconds.

The extremely short time during which the attack plane will be under fire arises from its high speed and its method of attack and is the governing factor which will control the design of the weapon for defense; its mount, its rate of fire and its system of fire control. Its caliber should be such as to assure effect upon vital parts of the plane when hits are obtained, and, since considerations of weight (of gun, mount, and ammunition), rate of fire, flexibility, and cost, are all adversely affected by large caliber, it should be kept to the minimum necessary for the purpose.

To digress a moment, this time element shows how useless will be any attempt to scatter a column, or even personnel, after the attack is perceived, in order to reduce the effectiveness of enemy fire. Machine gun fire may be expected to come from the plane as soon as it appears, and, even if it does not, the bombs will be dropped not later than five seconds thereafter; small progress toward scattering could be made by vehicles in this time, even where terrain conditions were favorable. The seeking of cover by personnel of a battery in position, when pits are immediately available, is a different matter and good advantage could probably be taken of them in the time available.

We may now lay down our primary and basic requirement - that our weapon should be capable of going into action with the least possible delay and should be capable of tracking the plane continuously throughout its all-too-short visible flight. It will do us little good to have a weapon with so little flexibility that it cannot be trained upon the plane and begin to fire in, say, less than two seconds, for we may many times be attacked by a plane which will be over our heads and dropping its bombs in a matter of three or four seconds after its initial appearance. The placing of fire upon the plane as early as possible during these first few seconds is of vital importance. It should be borne in mind that while the plane is approaching our weapons it probably will be constrained to fly a more or less straight course in order to place the fire of its machine guns upon us. During this period it is a much easier target to hit since its angular speed is low. The morale of our gunners may be expected to be better during this period than it will be later when the plane has dropped its bombs; besides, the target which the plane later presents will be more difficult to hit since it will be free to change direction, or altitude, or both, during its departing flight. Achieving success in the requirement for flexibility in the weapon is more than a matter of its being possible to direct it at any point in the heavens: it is necessary that it be capable of being traversed and elevated rapidly to the direction of the plane from any position, without regard to the amount of movement necessary, and that it be capable of taking up the tracking of the plane at once and coincidentally with the opening of fire upon it; it must be capable of direct overhead fire; it must be capable of equally efficient performance regardless of any displacement from normal (by reason of slope of ground or unusual road conditions) of the base or carriage upon which it is mounted.

It will likewise do us little good to have a weapon which cannot track the plane continuously, for the time element makes it necessary for us to utilize the full time that the plane is within view in our endeavor to bring it down. This problem of continuous tracking which we will strike in these situations is one with which we are not generally familiar. Due to safety requirements for our peace time anti-aircraft machine gun training we have been accustomed, not to the type of target which we will encounter in the attack plane - with its high angular speed as viewed from the gun, its sudden appearance unheralded and at short range, and its passage directly overhead necessitating fire at continuously increasing elevations until the line of fire passes through the vertical with subsequently decreasing elevations - rather, we have been accustomed to fire at targets moving at slow speed across our front and at altitudes considerably greater than any we may look for in

time of war. It is essential that any weapon which we develop be capable of this overhead type of tracking, for it must be remembered that the enemy will place reliance for effect chiefly upon his bombs and that his overhead flight, or very nearly overhead flight, is necessary in order for him to drop them upon us.

The second requirement of our weapon is that it be capable of extreme rapidity of fire for short bursts of, say fifteen seconds duration. The volume of fire delivered at a plane should be as great as practicable in order to secure a high rate of hits per minute; the rate of fire of our present water-cooled machine guns is considered to be well below that which is desirable in this respect.

The third requirement of the weapon is that it be given such a fire control system that its cone of fire can be placed upon the plane quickly and held upon it while it is in view. Here is a requirement which is going to give us lots of trouble before we arrive at a suitable solution.

It seems desirable to consider seriously the matter of providing some armor protection against machine gun fire for the crew of the weapon, provided it is adapted to such a measure; the moral effect of such armor offers probabilities of increased efficiency to such an extent as to make it of sufficient importance, almost, to limit armor as a requirement.

The requirements which we have laid down for flexibility and rate of fire, with the probability of a caliber in the nature of our small arms being sufficiently large, point to an automatic, or at least a semi-automatic weapon of rifle caliber or larger. The striking power of the weapon should be sufficient to be effective and must keep pace with such developments as take place in the armor carried by the plane. In any event, it seems highly improbable that plane armor capable of turning the armor piercing .30 caliber bullet will ever be employed due to weight considerations, though, of course, it is possible that we may be forced to larger calibers or higher velocities in order to secure greater effect from hits variant from the normal, which with the smaller caliber or lower velocity might not secure effect against such armor as is carried.

Fire recently conducted at aerial targets has demonstrated that the .30 caliber automatic rifle is capable of a higher percentage of hits against such targets than is the standard machine gun of the same caliber when the latter is fired from the many forms of tripod mounts which are in use at present. Data so far available on this subject should not be taken as conclusive as regards the comparative efficiency of the two weapons, for the capabilities of the machine gun have not been, by any means, exhausted and there is good reason to believe that developments now in progress in this field will result in far greater efficiency than we have hitherto had from it. A large increase in efficiency of fire from the automatic rifle may not be as confidently expected, for its fire is not as susceptible of improvement by means of mechanical devices as is the machine gun, but depends in great part for its successful delivery of fire upon its skillful handling by the individual. It is believed that lack of proper mounts has held down the efficiency of the machine gun in its adaptation to fire against targets of the attack plane type.

The automatic rifle, fired from the shoulder, is capable of a high order of flexibility for our purposes and answers in this respect one of our requirements by going into action quickly in any direction, speed in this regard being dependent only upon the skill of the individual handling the rifle. At first glance, when a single rifle is considered in comparison with the machine gun, it would appear that it is deficient in rate of fire; in using the automatic rifle however, a number of rifles are employed, which increases the number of rounds fired by a group although the rate of fire of each individual is low. Considering the number of men who could be armed with the automatic rifle for protection against attack planes, it seems that this weapon could well be considered as capable also of satisfying the requirement of a high volume of fire.

The automatic rifle has one inherent characteristic which might ultimately force us to discard it; this characteristic is that, being fired from the shoulder, there is a limit as to the recoil energy which can be satisfactorily withstood by the firer. If, and when, we are required to increase either our caliber, or our velocity, we may run into a greater recoil energy than the individual can absorb, or, in the lesser case, so great a recoil energy as to reduce to an inefficient level, either his rate of fire, or his accuracy, or both. Thus the automatic rifle has limitations which, in the event of our needing more striking power, (and that is not by any means improbable), may result in its abandonment: until this eventuality becomes a fact however, the continued exploration of this weapon's capabilities is certainly desirable, even though, as was indicated above, the efficiency of the machine gun may be greatly enhanced by developments in the near future.

It has been indicated that for this special type of power with which we are confronted we must develop a suitable fire control system that will meet the situation. With regard to the automatic rifle this need is not so imperative, for its past success in all probability is due to the fact that it has been fired by the individual in much the same way as the duck hunter fires - with estimated leads learned from experience and with skill retained through practice; thus its basic fire control system exists in the individual. However, even for this weapon, mechanical aids might well be investigated, but if failure to increase its efficiency by that means results it still can function with promise. The need for a fire control system for the machine gun is a different matter and one which we should bend every effort toward solving.

The first solution which offers itself for the machine gun fire control system is the tracer bullet. Few of us have fired the tracer at a target which has been so flown as to simulate the flight of the attack plane, and, until this type of fire control is attempted at such a target, it is hard to understand the difficulties which are immediately encountered. These are due to certain characteristics of the tracer bullet and to certain conditions which arise in this particular firing problem; taken all together they cast serious doubt upon the suitability of tracer control for fire at this type of target.

Everyone who has seen tracers fired at a moving target is familiar with the optical illusion encountered, whereby it appears that the tracer, instead of keeping to its initial direction, curves off in a direction opposite to the direction of movement of the target. The reason for this optical illusion lies in the fact that the target, which is moving and which we are tracking with our eyes, is the object upon which we sense direction since our attention is focused upon it and it is generally silhouetted against a uniform background. The extent of the apparent curve of the tracer is thus dependent upon the angular rate of speed of the target as we view it. This curve of the tracer is familiar to us from firing at targets some 400 feet in the air and moving at about 100 miles per hour; even at this angular speed we have experienced the fire control difficulties which the illusion engenders. It seems extremely probable, when we increase the angular rate of speed to that which corresponds to a 200-mile

per hour attack plane flying at an elevation of 40 to 100 feet and at very short range, that the resultant optical illusion will become so exaggerated that the tracers will appear to shoot off at a very sharp angle, increasing greatly the difficulty of sensing the position of their trajectory with respect to the target. The tracer starts to burn in the bore of the gun and continues to do so for a much greater distance than any range at which we may fire at an attack plane; with the tracer appearing to move on a curve any sense of direction based upon viewing the tracer is extremely difficult due to the difficulty of sensing where the tracer was when at the range of the target; this difficulty is greatly increased by any increase in the extent of the apparent curve of the path of the tracer. It seems very probable that for this reason, if for none other, the tracer may prove entirely unsuitable.

During daylight the ease with which tracers may be seen depends greatly upon the character of the background against which they are fired. When the sun is shining, tracers fired into that half of the hemisphere which contains the sun are sometimes difficult to see, especially so when there is a mottled background of light clouds; the closer the line of fire approaches the direction of the sun the greater the difficulty becomes until, when still well away from firing directly at the sun, the tracers become totally invisible. When we recall that the enemy may be counted upon to take advantage of the sun when selecting the direction from which he will attack, we find in this an additional reason to look with suspicion upon the tracer for our purposes until we have proved it for such.

One more thing about the tracer and we will pass on. Granting that they can be seen, utilization of the tracers requires the firing of several rounds, the observing of their position with respect to the target, the appreciation of this observation, subsequently effecting change in the direction of the tracer stream. Here, we are dependent for accuracy upon a mental operation based upon discerning with good judgment which of the visible tracers are those originating from the gun in question (in our situation there will probably always be more than one gun in operation), then the position of the tracers with respect to the target - both further complicated by the necessity for the gunner's keeping one step ahead of the target in regard to the matter of the ever-changing necessary lead. This places a heavy mental load upon any one man, especially when his mind is possibly already occupied with the confusion of the moment. The performance of these mental operations under pressure at high speed may reasonably fall far short of efficiency.

If future tests should demonstrate that we should abandon the tracer as a control we will have to go to sights and it is here that we may find a solution. Several things peculiar to the probable operation of attack planes lend themselves to the use of sights.

The ranges at which we may expect to fire at these planes are such that for practical purposes we may disregard the drop of the bullet, i.e., we may regard the trajectory as being a straight line: a companion assumption possible under these conditions is that the velocity of the bullet remains constant. These simplify the problem at the very start and the errors introduced are practically negligible.

The top speed of the enemy's attack planes is going to be known within certain limits and it seems probable that the human equation will result in his pilots flying their planes at top speed in order to keep down the length of time that the plane is exposed to fire. This, with the preceding assumptions, and for initial trial at least, enables us to determine fairly well the amount of the actual linear lead necessary for any given conditions of flight.

If the enemy is going to seek concealment by hedge-hopping flight he will necessarily come upon us at low altitude and it will be usual for him to fly a more or less horizontal course, at least until he is beyond his target.

These assumptions as to the velocity and trajectory of the bullet, speed, and the range, make it an easy matter to construct a sight, for any given plane speed, which will automatically apply the necessary lead within some 600 yards and for all horizontal flight. It seems promising to give the gunner such a sight, relying upon the dispersion of the cone of fire to take care of minor inaccuracies which develop by reason of conditions not being the same as those for which the sight is built. Certain allowances may be made in the judgment of the gunner, as are obviously indicated by special conditions of the plane's flight, although it is entirely feasible to apply corrections mechanically by some member of the gun crew whose duty that is. Such a sight control would give the gunners one thing upon which to focus their attention, instead of trying to think of several things at once and, in any event, it would insure at least that the cone of fire was somewhere near the target; an accidental hit is no less a hit by reason of its accidental nature.

This article might well go into a description and discussion of many mounts and methods but purposely refrains from doing so, its purpose being to present the general aspects of what is a subject having many ramifications, any one of which affords ample material for discussion (as witness our digression from the general into the specific in the case of the subjects of tracer control and sights).

* * * * * * * *

In conclusion, our problem is to seek, by fire or other means, to drive the enemy up into the air where we not only reduce his effectiveness against us but we push him into the limelight where he is, or should be, attacked by our own planes and by our large caliber anti-aircraft guns. We must approach this problem with the realization that it is a serious one. Its solution will probably be found in equipment and methods which are a radical departure from those which have been used for the solution of other problems.

There should be no necessity to point out that this equipment and the methods of its employment probably will be unsuited to, and different from, those which are to be employed against higher altitude targets; emphasis must, however, be placed upon this fact for it is in danger of being constantly overlooked.

The effectiveness of such equipment and methods as are devised, should be proven by test and not by conjecture. These tests must embody the time element and the surprise element, for those are essentials in determining the requisite quality of flexibility. This matter of test is a problem of its own, for it will require the devising of a target which will simulate the action of the attack plane. It will do us no good to conduct firing tests against the type of target which we have been using habitually for training in the past, for outside of the fact that the target which we have been using is moving and in the air, it is totally dissimilar in speed, altitude, and course flown, to that which the attack plane will present.

It should be noted that this need for a target is stated to be for test purposes; not for training purposes. As for the latter it seems reasonable, and also desirable, to conduct the major portion of our training with blank ammunition, the target being a plane or planes actually simulating attack, thereby affording them also, certain desirable training opportunities, and affording ourselves the necessary training, in fire discipline, of our animals, drivers, and other personnel. This would pro-

vide us, in addition, the opportunity for developing, under actual conditions measures for reducing the casualties which may be incident to the varying situations under which attacks may be made upon us.

---oOo---

RANDOLPH OFFICERS HAVE NARROW ESCAPE

Lieut. J.W. McCauley, Instructor on the Basic Stage, Randolph Field, Texas, and Lieut. Reynold D. Smith, a student in the School of Aviation Medicine, had a narrow escape recently when a forced landing was made by the light of a flare 20 miles east of Fowlerton, and the ship wrecked. These officers were reported missing after they had failed to arrive at Randolph Field from Laredo, where they had gone on a night flying mission. The next morning ten planes were dispatched to search for them. At about noon, Lieut. McCauley telephoned in that he and Lieut. Smith were safe. He stated that his motor stopped when they were 20 miles east of Fowlerton, which is on the eastern edge of La Salle County, and were forced to make an emergency landing by the light of a flare in the mesquite. There was no landing field within landing radius. The ship was completely washed out and both occupants escaped injuries. They were forced to walk 20 miles to the nearest telephone before communicating with Randolph Field. A plane was sent to ferry them back to Randolph Field that afternoon.

---oOo---

RESCUE MISSION BY SELFRIDGE FIELD PILOT

Another instance in which the Air Corps came to the aid of civilians in distress was that of a rescue mission performed near Selfridge Field recently by Capt. Fred C. Nelson of the 57th Squadron. A telephone call was received at Selfridge Field Operations Office one morning, stating that a Mr. Mulford of Detroit was marooned at the Old Club on an island in Lake St. Clair. Mr. Mulford was in no danger, but could not get to the mainland because of ice conditions on the lake, and he had an urgent business engagement which required his presence in Detroit.

Capt. Nelson offered to make an attempt to get Mr. Mulford ashore by plane. A golf course on the island afforded a safe landing place, the Captain found. He landed in an O-19 two-seater and within a few minutes had brought Mr. Mulford safely back to Selfridge Field.

---oOo---

PIONEER PARACHUTE JUMPER REWARDED

The Distinguished Flying Cross was presented to Master Sergeant Ralph W. Bottriell, 88th Service Squadron, Kelly Field, Texas, on Saturday, March 18th. The presentation was made by Brig. General Charles H. Danforth, Commanding General of the Air Corps Training Center.

Sergeant Bottriell was awarded the Flying Cross (meritorious or heroic service) for having made the first parachute jump from an Army airplane with the "free type parachute" in May, 1919. Prior to his jump the only type parachute used by the Army was an attached type which opened as soon as the jumper left the plane, as at that time it was the common belief that a man would become unconscious and not have the power to use his arms if he were to drop into space or delay the opening of the 'chute. As a result of Sgt. Bottriell's jump, the Army developed the present type parachute, and the long list of the Caterpillar Club bears witness to the excellent work that the new parachute has done.

Sgt. Bottriell, in charge of the Kelly Field Parachute Dept., has made over 700 parachute jumps from airplanes and balloons.

MAJOR MILLING TO GO ON RETIRED LIST

The announcement of the publication of War Department orders recently, directing Major Thomas DeW. Milling to proceed to his home to await retirement, was received with genuine regret in aviation circles. Major Milling has been in ill health for some time, and his inability to remain further in active service is a distinct loss to the Air Corps.

This pioneer Army flyer was born in Louisiana, March 31, 1887. He graduated from the United States Military Academy in June, 1909, and was commissioned a 2nd Lieutenant of Cavalry.

Detailed to the Signal Corps as a 1st Lt. in 1911, Major Milling was ordered on April 21 of that year to proceed to Dayton, Ohio, to undergo a course of instruction in operating the Wright airplane. Upon the completion of his instruction under the Wright Brothers, he was ordered to the Aviation School, College Park, Md., for duty, the government having leased a thousand-acre tract at that place for aviation instruction purposes. The first airplane was received at College Park on June 16 1911. Altogether four airplanes were received at the College Park Aviation Field - a Wright biplane, a Burgess-Wright, a Curtiss 4-cylinder and a Curtiss 8-cylinder plane. During his stay at College Park, Major Milling made a number of flights from that field to Washington Barracks, D.C., and return.

In the fall and winter months, the School was operated at Augusta, Ga., but in the Spring and Summer of 1912, operations were resumed at College Park. In August, 1912, Lieut. Milling with Lieuts. Arnold, Kirtland and Foulois participated in Regular Army and National Guard maneuvers in the States of New York and Connecticut and established several aeronautical records.

Following the transfer of the Aviation School from College Park to Texas City, Texas, in 1913, Lieut. Milling, on March 28th of that year, with Lieut. Wm. C. Sherman as passenger, made a cross-country flight of 240 miles from Texas City to San Antonio, Texas, in 3 hours and 50 minutes. Upon arriving over San Antonio, Lieut. Milling remained in the air for more than 30 minutes, thus establishing a new American duration record for pilot and passenger of 4 hours and 22 minutes. At that time this was considered a remarkable performance. The plane used was a Burgess Tractor, powered with a 70 h.p. Renault engine.

From 1913, when the Signal Corps Aviation School at San Diego, Calif., was established, up to the time of America's entry in the World War, military aviation was confined to only a few localities - in Texas and New Mexico along the Mexican Border and at Fort Sill, Okla. Following the opening of the Flying School at San Diego, Lieut. Milling was placed on duty thereat as Officer in Charge of Flying. In the fall of 1913 and spring of 1914, he traveled in France, Germany, Austria and England, attended aviation schools in those countries and made a study of aeronautical conditions.

Returning to the United States in the latter part of 1914, he served with the 1st Aero Squadron at Galveston, Texas, and later commanded an aviation detachment on the Mexican border at Brownsville, Texas. During the latter part of 1915, he served with the 1st Aero Squadron at Fort Sill and San Antonio, and conducted tests on the first automatic camera used in an airplane.

In 1916 and 1917, Lieut. Milling served in the Office of the Chief Signal Officer of the Army in Washington, D.C., during the course of which duty he organized the first flying school for the instruction of Reserve Military Aviators. Upon America's entry into the

World War, he was ordered to duty overseas with the American Expeditionary Forces. He had been promoted through several grades, and in August, 1917, held the rank of Lieut.-Colonel, and that of Colonel from August of the following year. During his service with the A.E.F., he occupied such responsible positions as Chief of Air Service Training; member of the Training Section, General Staff; Commanding Officer, Air Service Units, Toul Sector; Chief of Staff, Air Service, 1st Army; and Chief of Air Service, 1st Army. Upon his return to the United States from overseas duty in March, 1919, he was placed on duty in the Office of Director of Air Service as Assistant Executive, Training and Operations Group. Later he was assigned as Assistant Chief of the Training and Operations Group. In the meantime he reverted to his Regular Army rank, that of Major.

In June, 1920, Major Milling was transferred to Langley Field, Va., for duty in connection with the organization of the Air Service School for Field Officers. Placed in charge of this School, which was later designated as the Air Corps Tactical School, he occupied the position of Assistant Commandant until June, 1925, when he was detailed as a student officer to attend the Air Corps Engineering School at Dayton, O. Upon his graduation in July of the following year, he was detailed as a student officer to the Command and General Staff School, Fort Leavenworth, Kansas, graduating in June, 1927.

Ordered to duty in the Office of the Chief of the Air Corps in Washington, Major Milling was assigned as Chief of the War Plans Section, Training and Operations Division. From July, 1930, to September, 1931, he was stationed at Denver, Colo., on duty as Instructor, Air Corps, Colorado National Guard, following which he was assigned to duty at the Rockwell Air Depot, Coronado, Calif.

---oOo---

AIR CORPS AIDS REOPENING OF HAWAIIAN BANKS

That the airplane is the best medium of transportation for reaching places in a minimum amount of time, particularly in times of stress has been proven on numerous occasions. According to a report just received by the Chief of the Air Corps from the Hawaiian Islands, it appears that the airplane is a very handy vehicle to have around, especially on banking holidays. When Governor Lawrence M. Judd issued a banking proclamation for the Hawaiian Islands that scrip money would be used in the place of bank notes during the banking holidays, a problem arose as to how the banks on the other islands of the group could procure the scrip to enable them to open their banks on the same day that banks on the Island of Oahu were opened. The report says that the Air Corps, as usual, handled the situation with ease. Carrying large packages of scrip, two Army Sikorsky planes took off from the John Rodgers Airport, Honolulu, before dawn and flew to the outside islands to supply the banking institutions there with the new type of money. One plane unloaded part of the scrip at Maalaea Airport, Maui, and Upolu Point, Hawaii, before proceeding to Hilo, Hawaii. The other plane flew to the Island of Kauai. Both planes returned the same day. The bank officials of the Territory, to say nothing of the people awaiting their pay rolls, were most enthusiastic in their appreciation of the assistance rendered.

Amphibian airplanes were used because the routes flown by the pilots of both planes were almost entirely over water. The distance from the John Rodgers Airport to the Maalaea Airport is 150 miles. Upolu Point is 50 miles further on and Hilo 50 miles still further. The distance from John Rodgers Airport to the Island of Kauai is 90 miles, this stretch of territory being entirely over water.

NEW SHIPS LAND AT BOLLING FIELD

"We had the opportunity of seeing some types of service ships that rarely come to our station," says the Bolling Field Correspondent, "likewise some crack commercial ships that we read about. Mr. Dickman, of the Vought Corporation, brought to our attention a Vought Observation plane, which he flew to the Materiel Division at Wright Field for service tests. Lt.-Col. Hickam flew a Curtiss A-10 from the Third Attack Group at Galveston, Tex. This is similar to the A-8 that comes here frequently from Edgewood; the particular difference in the planes is in the power plant. The A-8 is equipped with a Curtiss 'in line' motor, and the A-10 flies with a radial motor.

Commander Frank Hawks landed his 'Sky King' chariot at the Naval Air Station the other day and although we did not get an opportunity to inspect the plane, his excellent landing of the ship, on the short way of the field over Hangar #5, attests to the reports we read of the ship in the papers. With a top speed of over 200 miles per hour, the landing speed is no greater than that of our Observation planes."

---oOo---

PILOT FLIES CRIPPLED BOMBER 60 MILES

The advantage of having airplanes in the Air Corps capable of flying on one motor was demonstrated recently, when Lieut. Laurel J. Gephart, 11th Bombardment Squadron, brought his Curtiss "Condor" into March Field from Fall Brook with one motor completely cut off. Motor trouble developed more than 60 miles from March Field and gradually became worse as the pilot and his co-pilot, Lieut. Henry Celik, attempted to locate the trouble. In order to save damage to the motor, the switch was cut - a fortunate accomplishment, for it was later found that bearings in the motor had burned out. Continued use of the motor might have resulted in irreparable damage. The altitude of the plane at the time the switch was cut was 1500 feet. The load of the plane included several thousand pounds of gas and three passengers. With the good motor working at less than maximum capacity, the altitude was increased to 2500 feet without difficulty. Lt. Gephart turned across the range of mountains to the east, and following Temecula Valley landed at March Field a short time later.

---oOo---

FIRST FLIGHT OF STATE OFFICIAL IS AT NIGHT

On his first airplane ride, the Adjutant General of California was rushed to El Paso, enroute to Los Angeles, to assume charge of the earthquake relief work.

Adjutant General Howard was in New Orleans on business when news reached him of the earthquake. He came to San Antonio by train and was hurried to Randolph Field in an automobile and flown to El Paso by 2nd Lieut. M.F. Daly, flying instructor. His first flight included a night flight. They departed from Randolph Field at 3:15 o'clock in the afternoon and the ship was equipped with night flying equipment so they could land in El Paso after dark. At El Paso, Adjutant General Howard was met by a pilot from the California National Guard and returned to the West Coast.

---oOo---

Barksdale Field is the proud parent, as of April 3rd, of a bouncing new squadron, the fighting 79th Pursuit. A flood of local recruits are being acquired, and Barksdale Field might almost be referred to as a Louisiana Parish. Captain Roy W. Camblin just arrived from Hatbox Field, Muskogee, Okla., and will command this unit, which was reconstituted as of April 1, 1933.

V-6415, A.C.

DUCKS AND DRAKES AT PATTERSON FIELD

OVER the course at Patterson Field where Uncle Sam's military airplanes are tested for high speed, a mythical sign was erected about the middle of March, reading - "Course Closed Until Further Notice." It had been erected by Ducks - 3000 strong, who flew in from the south, liked the puddles and little lakes set out over the speed course by heavy rains and decided to make them a temporary home.

That a community of 3000 has a powerful voice, especially if its members speak as one, even if those members are but ducks and drakes, was amply demonstrated. When an airplane flew over the speed course, they would rise in hot indignation that the peace of their homes should be disturbed. They would rise, then loyally return to their same puddles and to their seasonable occupations of mating and feeding. The speed course evidently offered a delectable feeding ground, for even the roar of motors did not frighten them away. The pilots flew over the field endeavoring to drive them out without success. Of course, with the first warm days they would be winging their way north. But in the meantime, speed course pilots had to bide their time in patience and do other test work. The high-powered military airplanes waiting for their touchiest test, high speed at ground, also had to be content to demonstrate their less spectacular qualities, fuming no doubt at being kept from the air by as poor flying rivals as ducks.

When testing over the speed course, however, all conditions must be right. The plane must fly at low altitude, the pilot must be steady at the controls, the air must be quiet for proper results, and at the terrific speed at which the airplane flies the small matter of a duck might cause a broken wing, a broken propeller or a lost life. Oh yes, the ducks, and their mythical sign, "Course Closed Until Further Notice," were in control at Patterson Field until the Spring days sent them flying farther north.

---oOo---

MARCH FIELD AIDS EARTHQUAKE STRICKEN AREA

Another chapter was added to the constructive peacetime work of March Field. In response to pleas from the vicinity of Long Beach, the resources and efforts of this station were furnished as needed. Two rolling kitchen outfits were sent by truck to South Gate and Seal Beach, respectively, for the purpose of boiling water for drinking purposes and preparing food furnished by the municipalities. A crew of Army cooks at each place served a total of approximately 2,000 persons per day. Numerous photographic missions were accomplished in order to ascertain the extent of damage done and the needs of the community.

Under the direction of Captain R.E. Selff, 60 enlisted men in a caravan of 13 Army trucks, transported 104 cots, 900 blankets, 112 tents, and 201 mattresses to Long Beach. The truck train departed from March Field at 12:50 a.m., Tuesday, March 14th, arriving at Long Beach shortly after daylight. By 8:15 o'clock, temporary camp had been organized and breakfast served to the Army personnel. By 11:35, all the pyramidal tents had been set up in Recreation Park. The tent city was for use of people whose homes had been destroyed by the earthquake. The camp was policed and the truck train departed for home at 4:00 p.m., arriving at 10:45. Airplanes were utilized to the fullest extent in transporting needed supplies and personnel to the stricken area. Eighteen Sibley stoves were transported by air to Long Beach for loan to Lieut. W.R. Sweeley, who had constructed a tent city on the airport at the Army reserve base there.

The field kitchen and personnel located at South Gate were returned to March Field on March 16th. A telegram from the Mayor of South Gate expressed for the people of his city wholehearted thanks for the relief sent there by the Army. He was delighted with the efficiency with which the unit performed its duties. At the time this was written, the equipment and supplies at Recreation Park, Long Beach, and the rolling kitchen and personnel located at Seal Beach had not been returned to March Field. They will remain where they are as long as needed.

No damage of any consequence was suffered at March Field, although shocks were felt for several days.

---oOo---

A DAY'S WORK AT BARKSDALE FIELD

Up at six thirty. Ablutions completed shortly and so to mess hall where did ply myself with tasty foods. On line at seven and off for gunnery range. Repeated charges upon target failed to accomplish desired results. Discouraged somewhat and back to hangar at nine where several manuscripts awaited my signature. Did minor duties - then again to mess hall for most pleasurable part of day. Back to the line at one and did dive upon ground target with bombs. Target most elusive. Over to gymnasium at 3:30 where did pound squash ball (and my head) most soundly. At six ate heartily, discoursed with fellow Pepys until nine - and so to bed.

Another Day

Up at seven and remove hairy growth from face. To mess hall for doughnut and coffee. Then to hangar line and donned flying equipment. In the air at 8:15 on patrol mission. Enemy sighted and did attack him most vigorously (sans bullets). Landed at ten o'clock. Performed routine duties until noon when I did feel again the pangs of hunger. Appeased of hunger, again journeyed to line and flew from two unit three practicing formation work. Did go to gymnasium at four and abuse my aging body. Again j'ai faim. Again I ate and sometime later so to bed.

---oOo---

LIEUT. GODDARD LECTURES ON AERIAL PHOTOGRAPHY

Lieut. George W. Goddard, Air Corps, Director of Photography at the Air Corps Technical School, Chanute Field, Rantoul, Ill., recently delivered an interesting lecture at the University Club of Chicago on Modern Aerial Photography. The lecture, which was announced by a card bearing the inscription, "Bring Yourself Up To Date with The Army in the Air," was received enthusiastically throughout its two-hour length, by an audience of approximately 200 Chicago business and professional men, all graduates of the University of Chicago. With the use of lantern slides and motion pictures, Lieut. Goddard explained aerial photography as practiced and performed by the Air Corps, including in the lecture a history of aerial photography, its military uses, description of aerial photographic missions, equipment and methods, and showed motion pictures taken on aerial mapping missions in the Philippine Islands. Latest Air Corps aerial cameras and photographs were exhibited at the termination of the lecture.

Mr. Joseph L. Bache, District Superintendent Department of Education, Chicago, Ill., in a letter to the Chief of the Air Corps, referred to Lieut. Goddard's effort as one of the best lectures of the season. "We cannot but feel," he stated, "that not sufficient number of your men undertake to impart to the public the work in which you are engaged. Too many citizens are unacquainted with the value and high qual-

ity of the men of the army, especially in the Air Corps. Members of General Parker's staff who were present commended Lieut. Goddard's work highly, and he has been invited to repeat the lecture and show the pictures to the Army and Navy Club at an early date.

If you have more men like Lieut. Goddard we should like to get in touch with them."

---oOo---

NATIONAL GUNNERY CHAMPION HONORED

A Wing Review was conducted on Saturday, March 25th, in honor of 2nd Lieut. Winslow C. Morse, 95th Pursuit Squadron, National Gunnery Champion of 1932. Prior to the Review, Lieut. Morse was congratulated by Lieut.-Col. H.H. Arnold, who also presented him with the National Gunnery Championship medal.

Lieut. Morse won the National Gunnery Championship last September at the Langley Field matches. This is the second year that the 95th Pursuit Squadron has won the championship, Lt. D. D. Graves having won it for 1931.

---oOo---

BROTHERS GALORE AT CHANUTE FIELD

An inspection of the roster of military personnel at Chanute Field, Rantoul, Ill., discloses interesting facts as to members who are related, as follows: Two brothers, Lieuts. Ralph O. and Leon R. Brownfield; three brothers, Pvts. Arnold, Ralph and William Webster; two brothers, Pvts. Lyle and Verba E. Botkin; three brothers, Pvts. William, James and Vincent Kavanaugh; two brothers, Tech. Sgt. Milton B. and Pvt. Jack O. Silver; two brothers, Pvts. Clyde H. and Fred N. Davis; father and son, Corporal Richard and Pvt. Norbert Danko.

---oOo---

AIR CORPS OFFICERS DETAILED AS STUDENTS

The following Air Corps officers have been assigned by War Department orders to duty as students at the Air Corps Tactical School, Maxwell Field, Ala., for the 1933-34 course: Lieut.-Col. H.C. Kress Muhlenberg, from Hqrs. 5th Corps Area, Fort Hayes, Ohio; Captains Cornelius J. Kenney, Frederick W. Evans, Mitchel Field, N.Y.; Captains Arthur B. McDaniel, John Beveridge, Jr., 1st Lieuts. Roland Birnn, Lyman P. Whitten, Office Chief of the Air Corps, Washington, D.C.; Captain Vincent J. Meloy, Militia Bureau, Washington; Captains Byron T. Burt and Walter R. Peck, Maxwell Field, Ala.; Captain Samuel C. Eaton, Rogers Field, Pittsburgh, Pa.; Captain Oliver P. Gothlin, Air Corps Representative, Boeing Aircraft Factory, Seattle, Wash.; Captains Robin A. Day, Air Corps Detachment, Ft. Leavenworth, Kans.; Arthur G. Hamilton, Chanute Field, Ill.; Clements McMullen, Wright Field, O.; Howard K. Raney, Kelly Field, Texas; Lotha A. Smith, Fort Crockett, Texas; Joseph A. Wilson, Boston Airport, Mass.; 1st Lieuts. Ronald A. Hicks and David W. Goodrich, Bolling Field, D.C.; Robert B. Williams, Randolph Field, Texas; Gordon P. Saville, Barksdale Field, La. Also the following officers now on duty as instructors, Air Corps, National Guard units: Captains Charles Y. Banfill, Logan Field, Md.; John H. Gardner, Nashville, Tenn.; Guy L. McNeil, Birmingham, Ala.; George M. Palmer, Minneapolis, Minn.; 1st Lieuts. Lucas V. Beau, Jr., Denver, Colo.; Robert M. Webster, Hartford, Conn.; Carlton F. Bond, Pearson Field, Vancouver Bks., Wash.; William R. Sweeley, Long Beach, Calif.

Officers detailed as students at the Command and General Staff School, Fort Leavenworth, Kansas, 1933-35 course, are: Major Wm. O. Butler, Capts. George P. Johnson and Robert Olds, from Langley Field, Va.; Major Hubert V. Hopkins, Office of the Chief of the Air Corps, Washington; Captains Earle H. DeFord, Kelly Field; Idwal H. Edwards, Office of the Assistant Secretary of War, Washington; Ralph H. Wooten, Military Attache, Santiago, Chile; Majors Hubert R. Harmon, John C. McDonnell, Captains Sam L. Ellis, Harry A. Johnson, Frank M. Paul, Lowell H. Smith, 1st Lieut. John R. Morgan, now attending the Air Corps Tactical School, Maxwell Field, Ala.; and 1st Lieut. Kenneth N. Walker, Staff and Faculty, Air Corps Tactical School.

Officers to report about August 15, 1933, to the Army War College, Washington, D.C., for duty as students, 1933-34 course, are: Major Wm. E. Lynd and Capt. Clayton Bissell, upon completion of course at Command and General Staff School, Fort Leavenworth; Major Roy M. Jones and Capt. Arthur W. Brock upon completion of course of instruction at the Army Industrial College, Washington; Lieut.-Colonel John H. Pirie and Major Leslie MacDill from Office Chief of the Air Corps, Washington; and Major Ralph Royce, Office Chief of Staff, Washington, D.C.

Officers detailed for duty as students at the Air Corps Engineering School, Wright Field, Dayton, O., reporting not later than August 1, 1933, are: 1st Lieut. Alfred H. Johnson, 2d Lieut. Kenneth A. Rogers, from Randolph Field, Texas; Capt. James A. Woodruff, 2nd Lieut. Robert K. Giovannoli, Wright Field; 1st Lieut. Turner A. Sims, Jr., U.S. Military Academy, West Point, N.Y.; 1st Lieut. Patrick W. Timberlake, Patterson Field, Fairfield, O.

To Army Industrial College, Washington, for duty as students, 1933-34 course: Captain Walter F. Kraus, A.C. Tactical School, Maxwell Field; Major Walter G. Kilner, Office of Asst. Secretary of War, Washington; Lieut.-Col. A.W. Robins, Wright Field; 1st Lieut. Edw.H. White, upon completion of tour of duty in Hawaii.

---oOo---

TACTICAL SCHOOL STUDENT BODY FULL STRENGTH

The Student Body Cadre of the Air Corps Technical School, Chanute Field, Rantoul, Ill., which is composed of specially qualified young men enlisted for entrance in the School, is now, since restriction of enlistments was removed in November, 1932, filled to the authorized strength of 200. At this time several reservations have been made in future vacancies for men returning from foreign service with approved applications for reenlistment for Air Corps, Chanute Field. The first increment of recruits received since the removal of restrictions, has completed recruit training and was entered in courses on February 6th last, while the second increment, completing recruit instruction on March 1st, was entered in class on March 6th. These new soldiers are of distinctly high calibre, having been chosen from an eligible list of several hundred high school graduates. All of this student group have a complete high school education, while a fair percentage have had one or two years of college, and a few are college graduates with degrees. For filling future vacancies, the files of the Air Corps Technical School disclose an eligible list of approximately 750 names of approved applicants with higher than prescribed minimum qualifications.

---oOo---

Army Day, April 6th, was, under the supervision of Lieut.-Col. James A. Mars, Commanding Officer and Commandant of the Air Corps Technical School, observed at Chanute Field with aerial activities to which the public was invited. In the early morning, a flying echelon of 21 airplanes left Chanute Field on a 2-hour demonstration flight, visiting 36 Illinois cities and towns within a 40-mile radius of the field. This was followed by an aerial review, exhibitions of Air Corps tactics, smoke screen demonstrations, and parachute demonstrations by the graduating class of Parachute Riggers.

---oOo---

Let us hear from Crissy and Langley Fields.

THE MANEUVERS IN HAWAII

Again the 18th Composite Wing demonstrated the high degree of their training and readiness for war when once more within the year they locked horns, so to speak, with the fighting and bombing squadrons of the SARATOGA and LEXINGTON.

Outnumbered by more than two to one in the air, the Wing on Jan. 30th, took to the bushes literally and dispersed in concealed positions, from Hawaii to Niihau, where they awaited the enemy, reported en route to these Islands. The three squadrons of patrol planes from the Fleet Air Base at Pearl Harbor, commencing at 1:00 a.m., on the 30th, did a pretty piece of patrol work covering the entire sea area around the Islands. They were backed up by the 4th Observation Squadron, which operated from three outlying islands of the Hawaiian Group.

While not averse to tangling up in a dog fight with any number of enemy planes, the Blue Air Force realized that, with the preponderance of strength on the side of the Blacks, it was certain that any Umpires' decision would be unfavorable. It was therefore their policy to lay doggo awaiting a favorable opportunity to strike the enemy at a time most disadvantageous to him, and to make his attack on Hawaii as costly to him as possible. This opportunity came early on the morning of Feb. 1st, when an hour before dawn a Blue patrol plane sighted the LEXINGTON about 40 miles north of the Island of Molokai. Immediately sending in the information by radio, the patrol plane made a lone wolf attack, dropping two (theoretical) 100-lb. bombs on the Carrier; which at that time had sent off about half her complement of planes on their way to make an attack on Pearl Harbor.

The sudden appearance of these two 100-lb. babies on the crowded deck of the LEXINGTON would undoubtedly have created a mild confusion to say the least, as the remaining forty planes on deck had been warmed up and had their engines running. In the meantime, the entire 18th Wing had been assembled over Waimanalo and reinforced by 12 Navy Bombers from the Fleet Air Base proceeded out to sea on their way to make a real attack on the LEXINGTON. On their way to the rendezvous point, many units of the Wing proceeding towards Waimanalo passed the Black force in the air, but as they were on opposite sides of the Koolau Range on their way to attack Pearl Harbor, no dog fights ensued. About the time the Black Bombers were playing havoc with their diving attacks on Pearl Harbor, the lumbering Bombers of the 5th Composite Group were approaching their quarry - over which a very pretty dog fight was staged between the 18th Pursuit Group and the fighters of the Black carrier guard. Needless to say, the Bombers proceeded in their calm unhurried way thoroughly to demolish the LEXINGTON. Just as the units of the Wing were returning to their hidden nests another attack arrived at Pearl Harbor from the SARATOGA located about sixty miles South of Oahu, backed up by 24 catapult planes from the cruisers in that vicinity. Blue scouting planes followed them out to sea after their attack and reported their course back to the SARATOGA. This was verified by planes from the 4th Squadron operating from Molokai, and at 9:15 a.m. the Wing was again in the air over Koko Head, enroute to the SARATOGA, which was known to be at that time south and west of the Island of Lanai.

At 9:15 a.m., the Wing was over Lanai preparing to attack the SARATOGA (only ten minutes away) when the maneuvers were brought to a sudden close and radios sent recalling the Blue attack. Recall was all that saved the SARATOGA from the fate of the LEXINGTON, as she had just completed taking her last planes on board and was a more or less defenseless target. Thus ended the first phase of the Winter Maneuvers - the Black enemy having destroyed Pearl Harbor and the Blue 18th Wing having sunk the LEXINGTON and scared the life out of the SARATOGA.

The second phase of the maneuvers consisted of Wing Exercises designed to test the maneuvering of the Wing by radio control and in aerial gunnery and bombing test against targets secretly placed on the Waimanalo Air Reservation. Due to the Kona gale which was blowing on the morning of the 4th, which resulted in the roughest weather in years, the number of hits was below average.

During the third phase of the Maneuvers from Feb. 7th to 9th, the entire Wing acted as an enemy air force operating from carriers and from land bases on outlying islands. The Black invading forces were represented on the ground by a battalion of the 27th Infantry bearing flags to denote the type of troops represented. With their thorough knowledge of the terrain and best methods of approach, the 18th Wing was able to assist the attacking ground troops by bombing artillery positions and concentrations, straffing enemy columns and truck trains, and attacking machine gun nests. As the weather was consistently terrible - rain, mist and wind, the conditions were nearly approached that of war time as far as the air force was concerned. During one attack by the 18th Pursuit Group on ground troops, the ceiling suddenly dropped from 800 feet to zero. Much relief was experienced when all units finally reported down safely.

The 26th Attack Squadron experienced a complete loss of visibility and was widely scattered - two planes landing on Molokai and one on Maui, with six others on various emergency fields on Oahu. That no casualties, nor crack-ups occurred is in itself a high testimonial to the training and piloting ability of the individuals of the 18th Group. The condition of the equipment during the whole of the maneuvers pays a high tribute to the mechanics and crews of the 18th Wing, there being not a single forced landing or hitch of any kind. When one considers that practically all flying here is done in land planes over the sea, it can be readily understood how much a pilot appreciates the excellent maintenance and engineering work which is being accomplished here and at Wright Field.

All in all, the Maneuvers were most interesting and successful from our standpoint. It is believed they furnish the best possible test of the preparedness for war as we are able to determine from actual operations what we can do and what we cannot. An enemy attacking these Islands will find the air force quite unperturbed - almost nonchalant you might say.

---oOo---

Fourteen National Guard and Air Reserve officers reported for duty at the Technical School Chanute Field, for duty as students in various courses for officers given thereat.

RESERVE OFFICER KILLED AT CHAPMAN FIELD

It is with deep regret that Mitchel Field reports the death of Lieut. Charles W. Stouff at Chapman Field, Fla. The gunnery season with all its hazards had been very successfully completed and the 5th Observation Squadron was actually on its way home when the accident occurred. The Squadron took off from Chapman Field early in the morning and was forced to return because of bad weather at Miami. It was on this landing that Stouff was killed. All the ships landed singly with ample room in between. About a quarter of a mile from the field Stouff was seen to go into what looked like a half roll and head straight for the ground. No one could determine the cause of the strange dive into the ground.

"Charlie's loss," says the Mitchel Field Correspondent, "is deeply felt by the entire post, and particularly by the officers and men of the Fifth Squadron. He has always proved

himself to be an efficient officer, an excellent pilot and a warm friend.

---oOo---

OCCUPATIONAL DISEASES OF FLYING PERSONNEL

What effect does continued flying have on the personnel so engaged? That is, barring crashes and other accidents, what out of the ordinary happens to the person who is engaged in flying over a number of years,- whose life work is more or less in the air?

The following are those occupational diseases incident to flying which have been noted as occurring to an unusual degree among military flyers. Undoubtedly the casual flyer who flies when he wills, the person flying in closed cabin and soundproof planes or, in general, those whose flying is markedly different than that performed by military fliers, will not be affected in the manner described below. The military flyer, however,he who spends his working lifetime engaged in tactical flying, can look forward to certain "diseases," or, to term them more appropriately, "occupational ailments," for the layman invariably connects the word "disease" with contagious or infectious sickness.

While there is probably no disease which is peculiar to the flyer, there are certain diseases which are so frequent as to merit being considered occupational. His work is such that it requires constant attention and he is always under some nervous strain, this strain being intensified by bad weather conditions, extra hazardous flying, unusual flying, type of flying to which the pilot is not accustomed, and long periods of flying over difficult or dangerous terrain. The pilot, being constantly under a nervous strain, frequently develops an anxiety neurosis or more frequently a neuro-circulatory asthenia or staleness.

Other diseases or conditions to which the flyer is heir by reason of his work are the following:

Pterygia or growths on the eyes due to the wind blast.

Photophthalmia and snow blindness when flying over snow-covered terrain or over bodies of water.

Deafness and ringing in the ears are common conditions among flyers due to the constant roar of the engine, or blocking of the Eustachian tubes on account of changes in altitude.

Rupture of the ear drums is fairly common due to the inequality of air pressure in rapid dives made by Pursuit pilots.

The development of an hypertrophy or enlargement of the turbinate bones of the nose due to the change in temperature of the air inhaled is common.

Sinusitia is fairly common among pilots due to the sudden change in temperature inhaled,and the consequent interference with the circulation of the blood in the membranes lining these sinuses.

Various types of gastric neuroses are fairly common, also probably due to the nervous strain they are constantly under, and the more sedentary type of work.

Renal calculi or kidney stones are very common among flyers, the reason for which is not definitely determined, but it is thought to be due to the position the flyer is in when flying, the lack of fluid and the changes in temperature he encounters.

Constipation is also very common, due to the sedentary type of work or lack of fluid while on long flying missions.

The effects of the above diseases are cumulative and increase with the period of time spent on flying duty itself.

---oOo---

"This is a flying age," orated the orator,-"time flies - man flies - "

"Horse flies!" yelled the heckler.

WAR DEPARTMENT ORDERS

CHANGES OF STATION: To Panama Canal Zone: Major R.L. Walsh, Wright Field; Major Junius H. Houghton from Middletown, Pa. Air Depot; Capt. Alonzo M. Drake, Wright Field.

To Hawaiian Dept.: 1st Lt. Morris R. Nelson from Randolph Field; 2d Lt. Delma T. Spivey from Langley Field; Capt.J.E.Duke,Randolph.

To Philippines: Capt. Martinus Stenseth from Militia Bureau, Washington, D.C.

To Hamilton Field, San Rafael, Calif.: Capt. Don L. Hutchins, Office Chief of the Air Corps.

To Maxwell Field, Ala.: Capt. Odas Moon, Kelly Field, for duty on Staff and Faculty of A.C. Tactical School.

To Randolph Field, Texas: 1st Lt. Norman D. Brophy from Graduate School of Business Administration, Harvard University; 1st Lt. F.A. Bacher, Langley Field.

To Rockwell Field, Calif.: Capt. Robert H. Finley, Hawaiian Dept.

To Fort Benning, Ga.: 1st Lt. John W.Warren from Hawaii.

To Chanute Field, Ill.: 2nd Lt. Milton M. Towner from Panama.

To Fort Crockett, Texas: Capt. Oliver S. Ferson from Philippines;

To Boston, Mass.: 1st Lt. David R. Stinson, Middletown Air Depot, to command Airport.

To Middletown, Pa. Air Depot: 1st Lt.Stanley Umstead, Bolling Field.

To Wright Field, O.: 1st Lt.Bennett E.Meyers from Babson Institute, Boston, Mass.; 2nd Lt. D.L. Putt from Selfridge Field.

To Fort Leavenworth, Kans.: Capt. Ralph H. Wooten, for duty as student, from duty as Military Attache, Santiago, Chile; Major George H. Brett, Selfridge Field,for duty as Instr.

To Scott Field, Ill.: 1st Lt. Harold H.Carr from Wright Field.

To Mitchel Field,N.Y.: Capt. Leland W.Miller upon completion instruction at Graduate School of Business Administration,Harvard University.

To March Field,Calif.: 1st Lt. Paul H.Kemmer from Calif. Inst. Technology,Pasadena,Calif.

To Crissy Field, Calif.: 2nd Lt. Charles G. Williamson from Hawaii; 2nd Lt. Charles D. Fator from Hawaii.

To Brooks Field, Texas: Major Charles B. Oldfield from Command and General Staff School

To Selfridge Field,Mich.: Lt.-Col. Frank M. Andrews, from Army War College, to assume command.

To Seattle, Wash.: 1st Lt. Edward M.Robbins from Rockwell Field for duty at Plant of the Boeing Airplane Company.

To Washington, D.C.: Major Joseph T.McNarney from March Field, for duty as Instructor at Army War College.

To Panama: 2nd Lts. Stuart G. McLennan and Max H. Warren from A.C. Technical School, Chanute Field.

To Hawaii: 2nd Lt. James L. Daniel,Jr., from A.C. Technical School, Chanute Field.

RELIEVED FROM DETAIL TO AIR CORPS: 2nd Lt. Walter A. Rude to 6th Coast Art., Fort Winfield Scott, Calif.; 2nd Lt. John G.Coughlin to 25th Inf., Fort Huachuca, Ariz.

ORDERS REVOKED: Assignment of 2nd Lt. S.V. Stephenson to Chanute Field from Panama; of 2d Lt. S.A. Ofsthun to Chanute Field from Hawaii; of 2d Lt. Thomas B. McDonald to Fort Crockett from Hawaii.

RETIREMENT: 1st Lt. Rowland Kieburtz,March 31, 1933, for disability incident to service; Major Thomas DeW. Milling from Fitzsimons General Hospital, Denver, Colo., to proceed to his home to await retirement.

DETAILED TO THE AIR CORPS: 2nd Lt. Orrin C. Krueger, Inf., and to proceed to Randolph Field, Texas, July 1, 1933, for flying training.

He: I'm going to try for an endurance flight.
She:I thought you were practicingfor something.

COLOR DETAILS OF ARMY AIR CORPS TACTICAL SQUADRON INSIGNIA

1st Observation Squadron: A brown cave man wearing a black breech clout, standing on a black mound, looking to dexter with right hand shielding his eyes, left hand holding a spear horizontally, in front of a rising sun against a blue background; all within a green bordered gold annulet bearing thirteen black crosses patee.

94th Pursuit Squadron: American Indian Head, face brown with black, blue and red markings. War bonnet white feathers tipped with blue, yellow and blue head bands, ribbons red and blue.

16th Observation Squadron: Binoculars, white with black shading.

95th Pursuit Squadron: Mule, brown on light blue circular background.

22d Observation Squadron: Blue disc, white stars, red to yellow tail.

9th Bombardment Squadron: Black disc, within an orle of silver another disc gray and black, Roman numeral IX in silver.

26th Attack Squadron: Shield - upper half orange; lower half, blue. Clinched fist, upper half blue; lower half, orange.

8th Attack Squadron: Eagle proper, white head. Bell, blue. Center circle white. Middle circle, green. Outer circle, yellow.

24th Pursuit Squadron: Tiger in proper colors.

44th Observation Squadron: Indian in blue silhouette on yellow disc piped with red.

27th Pursuit Squadron: Falcon, proper on a red disc.

2d Observation Squadron: A white disc within a black circle, rising out of green sea in the lower part of the disc Neptune riding a seahorse and holding in his hand a trident in black silhouette.

19th Pursuit Squadron: Cock black and white, red comb, on yellow disc, black border, 19 rosettes consisting of six pointed star and six dots all white.

3rd Pursuit Squadron: On a blue triangle piped in black point down a fanciful creature with the head of a parrot, the winged trunk of a lion and the tail of a sea serpent. Black head and trunk, red and white eye, orange bill, red tongue, white wing and orange tail.

55th Pursuit Squadron: Yellow disc bordered in blue, blue annulet, arrow and sword black, portion on border yellow. Wings proper.

99th Observation Squadron: Buffalo, red lined with blue.

34th Pursuit Squadron: Black futuristic bird, red eyes, red and white stripped breast, red lightning on white circular background piped in black.

73rd Pursuit Squadron: Golden bear with black shading, red eyes and tongue, on blue circular background piped in yellow.

11th Bombardment Squadron: Jiggs, black suit and hat, red vest, blue tie, white spats, light blue bomb, trimmed in orange, on circular white background with black piping.

91st Observation Squadron: Gray armor, green shield, black cross piped with white, yellow plume, brown spear, black horse, harness yellow, red devil, yellow background, brown fork superimposed on diamond; upper half, blue; lower half, green.

30th Bombardment Squadron: "Sergeant Branner", blue with black and yellow trimmings, and shoes in black border. Compass points green.

28th Bombardment Squadron: Indian Head, brown, yellow head band, yellow ribbon on hair, yellow beads. Black hair, ears and whiskers, white eye with black pupil, face markings red piped with yellow, red mouth, blue feather tipped with red - blue diamond.

35th Pursuit Squadron: Silver oval within a blue border, a black panther, tongue red.

72nd Bombardment Squadron: White clouds and lightning on circular background of black.

20th Bombardment Squadron: Pirate with tanned face, tan arms, black moustache, red cap with white stripes, yellow jacket, black cape and bomb; pants, shoes and stockings, brown. Alternate green and white stocks. Red bomb with two black bands, 11 black crosses on white field, all on rectangular white background piped in black.

96th Bombardment Squadron: Red devil, white aerial bomb. Black triangle with white edges.

23rd Bombardment Squadron: Black volcano, with red lava flow, black bombs, white clouds, futuristic rays, alternate orange crimson and yellow, piped with white, all superimposed on circular blue background.

13th Attack Squadron: Dark blue field, white skeleton, yellow scythe with bloody blade.

77th Pursuit Squadron: Natural.

5th Observation Squadron: On blue disc piped with yellow a yellow moon and 5 stars. Owl proper, silver telescope.

4th Observation Squadron: A cross estoilee divided per saltire and per cross gold and blue.

49th Bombardment Squadron: Gray wolf's head, red tongue, against orange disc edged with gray.

17th Pursuit Squadron: Owl, white on black field.

7th Observation Squadron: Blue diamond piped with red, white sword, and shield outlined in black, black portcullis.

6th Pursuit Squadron: On a circular orange field, a gray skull outlined in black forming the hub of a shaded spinning propeller done in black.

25th Bombardment Squadron: Man, proper, dressed in black, black masked, nose tip and sash red; gray axe with bloody blade; on circular white background, piped in black.

36th Pursuit Squadron: Cloudlike background of golden orange, bordered in blue, blue helmet and white goggles with black rims. Figure brown with bloody tongue.

15th Observation Squadron: Pigeon, proper, telescope white trimmed in black, shield blue above, yellow below.

90th Attack Squadron: Red dice outlined in white with white spots.

88th Observation Squadron: Rider and horse in black silhouette on orange disc.

12th Observation Squadron: Orange disc, hawk in deep gray, white head, black projectile.

50th Observation Squadron: Square, red above, blue below.

---oOo---

OUR COVER PAGE

The attractive cover page for this issue of the News Letter, showing the insignia of the various Air Corps tactical squadrons, was produced at the printing plant at Randolph Field, Texas, through the kindly offices of Captain James D. Givens, Air Corps, Secretary of the Air Corps Primary Flying School.

We extend our sincere thanks to Captain Givens for his interest in behalf of the News Letter. He has already furnished cover pages for several previous issues of the News Letter and to say that we appreciate his cooperation would be putting it mildly. Thanks again.

So you are in the Air Corps now! What do you do?

I'm a fireman on an airplane.

G'wan - they don't have such things.

Sure - I fire the machine guns.

- V-6415, A.C.

PARACHUTE JUMPS FROM HIGH SPEED PLANES

A QUERY was recently propounded to the Air Corps as to whether experience has already been gained in the United States as to the suitability of parachutes for leaps from the extra rapid mail and courier airplanes recently introduced into air traffic. Doubt was expressed as to whether the parachutes used thus far still come up to the requirements that must be made of their stability in cases of distress, in view of the greatly increased speed of the airplanes.

Upon reference of this matter to the Materiel Division of the Air Corps, Wright Field, Dayton, Ohio, comment is made as follows, this on the assumption that the speed of the plane is about 200 miles per hour:

"First, that it is somewhat doubtful whether persons could get clear of an airplane traveling at this speed. As far as is known by the Materiel Division, this feat has never yet been performed. It seems a condition, therefore, that for successful jumping from such airplanes the pilot will have to reduce the speed. Of course, it is realized that there may be times, such as breakage of the wing or mal-functioning of the controls, in which the pilot might be unable to reduce the speed. What would happen in these cases is not exactly known and yet it would be advantageous to find out, if a practicable non-dangerous way of determining this could be found.

Drops have been made with dummy men on airplanes in dives at speeds which approached the one under consideration, i.e., 200 m.p.h. The dynamometer readings on these tests did not seem alarmingly high enough to endanger the strength of the parachute; however, recent experiments have led to the conclusions that a parachute dropped from an airplane in a steep dive is subjected to a higher shock than is one dropped at the same speed from an airplane in level flight. This is still in the conjectural stage and remains to be definitely proved. Our theory is that when a parachute is dropped, from an airplane in level flight, it falls in a somewhat curved trajectory and as a consequence the lower side or edge of its mouth is blown inward somewhat, during the opening stage and this pressure of air from the outside is the principal reason for the reduction in shock loading when compared with the parachute which has been dropped more nearly vertical and has not had the cushioning effect of this air pressure from without.

If anything is known of this subject, either conclusions or theories, information would be appreciated.

It has been determined by dropping parachutes with compact lead weights that the ultimate breaking strength of both the Irving and the Triangle parachutes is of the order of 8300 pounds. It is believed that this is definitely a measure in pounds of the strength of these canopies, but it has been assumed that it makes no material difference whether this amount of shock load is applied rapidly or more rapidly. In other words, we test for strength by dropping 1000 pounds of lead from an airplane in level flight traveling 100 m.p.h. At one time our strength test required the parachute to withstand the shock of opening caused by dropping 200 pounds of lead with a time fuse mechanism allowing it to fall freely for ten seconds before opening. This was usually launched from level flight at about 85 m.p.h.

Our calculations were that this ten second freely falling lead weight was traveling about 200 m.p.h. when the parachute opened. When this method was used, unfortunately, no dynamometers were available. However, from observations it was decided that the resulting destruction in both cases was about alike, for in either case it required a new parachute in good condition to withstand these tests.

Further, we have determined that, roughly, near sea level the terminal velocity of a man falling freely through the air is surprisingly low. Our figures vary from about 90 to 120 m.p.h. for a man weighing 180 pounds, and carrying on his body a parachute pack. Therefore, if a man leaves an airplane when it is traveling at speeds in excess of his terminal velocity, say 120 m.p.h., he will immediately decelerate, in fact he would appear to be blown backward. If he can get clear of the airplane, therefore, and he could by being thrown out, either accidentally or deliberately, which latter method is being carefully considered, it is thought that in the one or two seconds which are required for the parachute to deploy and open, a man's velocity could be reduced enormously. No instructions have been issued to the effect that it would probably be better to delay the opening of the parachute for two or three seconds when launched at extremely high speeds, but it is believed this is probably well understood.

Of course, it is not readily foreseen how one can have a parachute which will automatically open promptly at low speeds and yet successfully withstand the shock resulting from such rapid opening when subjected to high speeds. These two conditions appear contradictory and therefore a compromise seems the only solution."

---oOo---

NEW ENGINEERING SHOPS AT SAN ANTONIO DEPOT

"Our immense new Engineering Shops Building," says the News Letter Correspondent, "was completed in March, under the direction of Capt. A.F. Dershimer, Constructing Quartermaster for San Antonio and vicinity, and under general contract with the A.J. Rife Construction Co., of Dallas, Texas. This structure, which is of fireproof, one-story construction, is approximately 458 by 572 feet over all, and covers 7 acres under one roof, which is said to be the largest single roof ever put on in the State of Texas. The construction is of brick, structural clay tile, structural steel, cast stone and reinforced concrete, with metal lath and plaster, steel windows, steel truss, concrete, built-up steel deck and asbestos-protected metal roofing concrete floors and ramps, and comprises the Shops Building proper, the Dope House, and the Boiler & Utilities House, with two connecting bays, and the Paint, Oil, and Dope Storeroom. Six miles of water and gas mains were installed, besides the plumbing, heating and ventilating units, pacing, etc.

This building is the latest thing in shop construction and will add inestimably to the engineering service rendered by the Depot. It is one of which the Quartermaster Corps, which erected it, and the Air Corps, which will use it, may justifiably be proud. Work was also begun on the three new Quartermaster buildings at the Depot, the Warehouse and Maintenance Building, the Garage, and the Fire Station, which will fill a sorely felt need.

---oOo---

In attempting to complete a training flight to Buffalo from Selfridge Field, Lieut. Jesse Neal, Air Reserve, was forced by fog to land in a field at London, Ontario. He remained there two days, due to the extremely bad weather, and was entertained by the local inhabitants. Lieut. Neal returned to Selfridge singing the praises of international friendship, but was received rather coldly by his friends on the Operations Staff at Selfridge, who had become entangled in the red tape which surrounds the landing of a plane in foreign territory. Scores of telegrams had to be sent to settle the customs details and to make the proper diplomatic notifications.

"TWO WEAKS"

By Lt. Ebenezer Zilch

Under a recent War Department policy, a certain number of Army officers of branches other than the Air Corps are detailed by their Corps Area, or Department, Commanders to spend short periods of duty at Air Corps stations. While there on such duty they do not learn to pilot airplanes, but they do learn some of the other duties of Air Corps officers and, it is hoped, return to their organizations with an idea of what the Air Corps does at its daily toil. We can imagine their fearsome tales of their newly acquired prowess, once they are back with their fellows, in "Checking Forms 41," of "Going out on Mission 0-45," of "wrastlin' with an SCR-134 in the rear seat of a B-6," of "Pulling a Motor," or "Etching a Prop." And then some.

But, it may be added, a few Air Corps officers are also sent for tours of duty with the Infantry, Artillery and other branches to learn what the ground troops do in the course of their daily grind. They, too, have fearsome tales to tell when they return to their proper Air Corps station. Here's one of them from the Hawaiian Department, reprinted from the clever sheet "AERO-VUE," of the 18th Pursuit Group at Wheeler Field. The author is purported to be Lieut. Ebenezer Zilch. What a name! - But what a story!

There was once a time when undesirable Air Corps officers were issued on memorandum receipt to other branches to be disposed of as they saw fit.

One day the commanding officer called me into his office and announced that I had been assigned to the 15th Horse Caisson Army, which later turned out to be with F Battery of that organization. Now when I reported for duty the battery tested very high as to specific gravity, but at the end of my two weeks, the battery had hardly a spark left.

My course of instruction was turned over to a new officer who just arrived from the Point the day before, and he told me how glad he was to teach me all about the Field Artillery. He related as how his old man was a general, Chief of Something, and how he rated in Washington, and he would be glad to use his influence for a friend like me. Well, the horses had eaten all the salt, but I swallowed the story as best I could without it, and then related that my pa had been milking and spreading fertilizer for thirty years, but that did not make me a dairyman, and I told him he was just a brand new shavetail as far as I was concerned (on account I ranked him a couple of files and a hammer) and the next day I marched in to the C.O. to try to get an instructor commensurate with my rank.

Well, the C.O. looked at me out of the corner of his fist and brought his eye down against the table with a bang and told me if I ever came into his office again it would be just too bad, so I said "Yes, Sir" and saluted.

Next day my instructor said we would exercise the horses and started telling about the peculiarities of the animal. Now I had quite a bit of experience with animals similar to the horse in my youth (the ears were slightly different), and I learned long ago that the best place to preach a mule funeral was at his head, so we mounted a couple and started off. A dozen other privates rode behind and led four other horses, but one horse was all I cared to be bothered with.

Well, the first mile of ups and downs showed my instructor that my horsemanship was nothing to brag about. Once I nearly fell, and he yelled something about losing my stirrup, so I did a hundred and eighty and charged to the rear to look for it. Several of the led horses broke loose as I galloped among them, and my instructor was yelling to keep away from the led horses. Now all these horses looked alike to me until one stepped on my shoe later, and then I knew he was one of the lead horses. Finally I happened to glance down and saw my stirrup still attached to the saddle. Was I sore! He said I had lost it, and there it was all the time.

Next day I reported with my parachute as I was used to sitting on one, and the saddle soon got hard in spots. The C.O. wouldn't let me use it, and not only that, but they showed more consideration for the horse as he had a blanket, and I didn't even have that. Day after day the situation got worse, until I was so sore of mind and body that I don't remember all that happened.

However, on the last day before my duty was over, the C.O. called me in and told me that I had shown marked improvement (those marks lasted for weeks) and he would allow me to ride in the parade they were having for the General next day. My instructor took me aside and gave me some dual in horse saber drill, and then he showed me my new parade horse. I reported with my new saber for the parade which was about ready to start. Somebody blew a whistle and the parade was off - and I still off my horse. The watering trough where I usually mounted was not high enough for this horse, so I got a stable boy to help me on. But I forgot to get another boy to catch me when I went over the top. I finally mounted and reported to the head parade officer who had stopped the parade until I got there.

I shall try to relate the incidents that happened in logical order, but no doubt omissions will be made.

We first rode by the General's stand with the saber at the carry position and the horse at a walk. The next time was to be the trot, and then a gallop. Well, I got by O.K. the first time, and was commended by the battery commander. We then started to trot - all but me. My horse bucked at the rattling caissons

and went everyway but on. My hands were so full of reins and sabers that I was helpless, and decided to drop one of them. The saber cost me nine dollars, so I dropped the reins. This was onviously a mistake, so I picked up the reins and dropped the saber. It stuck in the ground, and the caissons on the right of me and the caissons on the left of me volleyed and thundered - and was I catched! Each caisson pilot tried to see how close he could come to my saber, until I dismounted and rescued it. I placed the scabbard in the saber which was strapped to the saddle and tried to mount without the watering trough. The horse did one thing right - wheeled to the right and I swung gracefully into the saddle.

By that time all that was left of the parade was the wagon company, so I joined that as it taxied rapidly by. My next task was to draw my saber from the scabbard and place it in the carry position. The horse wheeled and almost nosed over, so I replaced the scabbard in the sword and righted the horse. I tried again and lost a stirrup and almost a horse. The General's stand loomed up ahead and I looked my horse and saw he was galloping. We had already gone by at a trot while I was saber hunting and horse quieting, and this was the last time.

Something had to be done to make restitution so I grasped the saddle with the pommel of my hand, with my remaining hand quickly drew the horse from the scabbard, bringing it to the carry position just as the General's stand went by.

Everything would have been fine except for a horse blanket which did not escape the General's eye, and the Battery C.O. had to redorse by implyment why his "F" Battery horse blanket passed in review the second time with the Wagon Company, with the saber still in the scabbard, and why not until the last time was the horse finally withdrawn from the saber and placed at the carry position.

---oOo---

OXYGEN CONSUMPTION AT HIGH ALTITUDES

Answering an inquiry as to the oxygen consumption of an aviator at altitudes of 15,000 feet or over, Lieut.-Col. A.P. Clark, Medical Corps, Commandant of the School of Aviation Medicine, Randolph Field, Texas, states:

"Owing to the technical difficulties involved, oxygen consumption cannot be accurately determined at altitude in airplanes by the Henderson Pierce rebreathing machine or by the various types of apparatus used in the closed or spirometric method of determining the respiratory quotient. These cannot be operated in the open type airplane capable of attaining and exceeding that altitude and the average closed cabin ship has only a ceiling of between 14,000 and 15,000 feet at the most. However, the open or gasometric method can be used where the subject breathes the atmospheric air of the altitude thru a specially constructed mouth-piece over a definite period of time, the expired air for the same period being collected in a Douglas bag. The total volume of expired air is ascertained by means of a gas meter and its oxygen and carbon dioxide contents are determined by gas analysis in a Haldane or Van Slyke apparatus. The difference between the oxygen and carbon dioxide contents of atmospheric and expired air represents the amount of oxygen utilized (consumed) and the amount of carbon dioxide eliminated. Corrections must be made for water vapor tension, barometric pressure, and temperature.

As the higher altitudes are attained with consequent lowering of the barometric pressure and the partial pressure of oxygen in the lungs, the deficiency in oxygen partial pressure must be compensated by breathing liquid oxygen vapor or gas oxygen from specially supplied containers. As the barometric pressure decreases the liquid oxygen vaporizing rate increases in an amount adequate to make up for the decreasing partial pressure of oxygen in the lungs. But the gas oxygen contained in cylinders at extremely high pressure must be metered through a regulator in a constantly varying amount depending upon the change in altitude. Of course, oxygen consumption varies with the individual, and according to his nervous and muscular activity. But the amount of oxygen consumed on the average by the aviator at high altitude under the condition of cold, lowered barometric pressure and exertion involved in piloting has been calculated and the following table showing the standard oxygen requirements in liters of oxygen per minute takes the above facts into consideration, the smaller value of flow being the average amount necessary for a pilot or observer during normal flying, while the greater value is the average amount needed for a pilot carrying out maneuvers or an observer swinging guns or cameras.

Air Corps Oxygen Flow Standards

Altitude	O_2 Flow-liters per minute
15,000	3.9-7.7
20,000	5.4 - 11.0
25,000	7.4 - 15.1
30,000	10.1 - 20.2
35,000	13.0 - 26.0

The following table shows oxygen requirements in terms of liquid oxygen per man-hour:

	Liters of Liquid Oxygen	Pounds of Liquid Oxygen
20,000	0.75	1.8
25,000	1.0	2.5
30,000	1.5	3.75
35,000	2.0	5.00

With reference to the influence of the lower temperatures of high altitude upon oxygen consumption it is known that absorption of gas by a liquid varies directly with pressure and inversely with the temperature. It would seem that the lower the temperature the greater the absorption of oxygen by the blood in the lungs but this is not true for the intra-pulmonic (the alveolar) temperature remains the same on account of the warming effect of the nasal and pharyngeal passages upon the inspired air. The important point is that the alveolar partial pressure of the oxygen must be kept approximately the same as when at the lower levels (below 3000 feet). This is done by the gas or liquid oxygen supply.

---oOo---

OFFICERS GRADUATE FROM ARMAMENT COURSE

On March 31st, the officers' class in Armament, Air Corps Technical School, Chanute Field, Rantoul, Ill., completed the course of instruction started on October 1, 1932, and were graduated on April 1st. This class of 18 Air Corps officers consisted of Capt. Wm. Turnbull, 1st Lts. Charles G. Pearcy, Bernard A. Bridget, John F. Guillett, Wm. H. Doolittle, 2nd Lieuts. George R. Acheson, James L. Daniel, Jr., Frank F. Everest, Jr., Charles G. Goodrich, Howard G. Bunker, Stuart G. McLennan, Fred O. Tally, Ralph O. Brownfield, Edward H. Alexander, Max H. Warren, Leon R. Brownfield, James P. Newberry, Douglas M. Kilpatrick, Jr.

The faculty of the Technical School was particularly gratified with the work of this class. The Director of Armament, Capt. Arthur G. Hamilton, under whose supervision the officers were trained, states that this class was of distinctly the highest calibre of the classes with which he has been concerned.

Diplomas were presented the graduates by Lt. Col. James A. Mars, Commandant, at a military review of all troops of the command.

V-6415, A.C.